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Knowledge, Information, and Household Recycling: Examining the Knowledge-Deficit Model of Behavior Change

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Education is often seen as the key to changing behavior. Indeed, how can people engage in environmentally significant behaviors if they do not know about the impacts of their actions, or about the details of how to engage in a specific behavior? Recycling and other conservation behaviors are becoming increasingly important as the harmful effects of human behavior on the natural environment become more evident. Each year, reports are presented about the increasing damage that human behavior is having on the natural environment—ozone holes, deforestation, overpumping of groundwater, and an overreliance on oil as an energy source. But is education sufficient to change behavior? This chapter examines the research on the effects of one educational approach—knowledge-based interventions designed to increase residential recycling rates. The knowledge-deficit model for information campaigns is presented, and research on three aspects of the model is summarized. Although the chapter focuses on a specific behavior (recycling), the basic principles discussed are believed to generalize to a range of environmentally related activities. Finally, an alternative educational approach focusing on social norms is presented, and some recommendations for implementing normative education programs are provided.

Before examining the knowledge-deficit model, it is important to clarify what I mean by "education." In the context of a social marketing approach, "educate" is often synonymous with "provide information." In working with recycling companies and with city and county recycling coordinators, I have frequently heard the phrase "We need to educate people about ___." Indeed, this same phrase can be found across a range of social marketing programs, and with regard to a range of behaviors. In essence, the educational activities involve

disseminating information about the topic or about the behavior, with the goal of motivating people to act. It is, however, important to point out that this is just one narrowly conceived approach, and that not all educational efforts are information-based (cf. Andrews et al., this volume, Chapter 10; Ramsey and Hungerford, this volume, Chapter 9). There is a rich literature on environmental education, much of which is experiential or affect-based. What follows is an analysis of information-based education interventions used to promote recycling.

SOLID WASTE AND RESIDENTIAL RECYCLING PROGRAMS

The disposal of solid waste is becoming both an environmental and economic burden. In 1999, the average person in the United States generated 4.6 pounds of trash each day—a figure that was up dramatically from 2.7 pounds per day in 1960 (U.S. Environmental Protection Agency [EPA], 2000). Combined, people in the United States generated 230 million tons of trash in 1999. Of this total, residential solid waste accounted for an estimated 60 percent, with the remaining 40 percent coming from commercial sources (EPA, 2000).[1]

By far, the bulk of the trash generated in the United States is buried in landfills. Of the 230 million tons generated in 1999, approximately 72 percent was buried in landfills, at an estimated disposal cost of around $30 billion each year—a cost figure that is projected to grow substantially in the next few years (EPA, 1998a, 1998b, 2000). Lowering the amount of trash buried in landfills has important economic as well as environmental consequences. Less trash means lower disposal fees, less strain on the diminishing number of landfills open to accept waste, and less consumption of raw materials.

The approaches to reducing the amount of solid waste generated by households in the United States can be classified as either Reduce, Reuse, or Recycle. The *Reduce* approach focuses primarily on purchasing—for example, purchasing items with minimal packaging or items that can be composted. An article summarizing the research on "green buying" by Thøgersen can be found in Chapter 5 of this volume (see also Hormuth, 1999; Mainieri et al., 1997). *Reuse* focuses on repeated uses of purchased items—for example, using canvas shopping bags or purchasing beverages in refillable containers. *Recycle*, the focus of this chapter, refers to the collection of used items for use in the manufacturing of new items. Nationally, more than 9,000 curbside recycling programs in the United States serve more than 134 million people, and both numbers are growing rapidly (EPA, 1998a).

At the city and county levels, when people talk about recycling it is often in the context of technical issues like the implementation of a new program, changing to an automated collection system, the distribution of recycling bins, zoning or siting landfills or transfer stations, and different types of recycling programs (e.g., commingled, pay-to-throw, or source separated). However, it is important to point out that recycling is a behavior, and like all human behaviors, recycling

is motivated and constrained by the context in which it occurs. The success or failure of a recycling program hinges on participation by community residents.

Recent reviews of the research on recycling and other environmentally significant behaviors have distinguished between personal and situational determinants (Hornik et al., 1995; Schultz et al., 1995). A *personal* behavioral predictor refers to a characteristic that exists within an individual. Examples of personal predictors include knowledge, attitudes, beliefs, personality, perceived control, and level of ascribed personal responsibility. *Situational* predictors are characteristics of the context that are related to the behavior. Examples of situational predictors include the types of materials collected, the location of collection bins, and the qualities associated with collection bins (color, shape, labeling).

Recycling programs have become common in communities throughout the United States and Canada. Within the past 10 years, all 50 U.S. states have passed laws requiring reductions in the amount of trash sent to landfills. California, like many states, has set a goal of a 50 percent diversion rate—that is, 50 percent less trash sent to landfills. In response to these laws, cities and counties have implemented many types of programs, one of which is curbside recycling. Although laudable, these diversion goals are difficult to reach, and many communities are struggling to meet diversion mandates. In an effort to encourage people to recycle, a number of intervention programs have been developed and implemented. These programs target both personal and situational variables, but the effectiveness is often questionable. Of the interventions used to promote recycling, the most common approach is based on knowledge.

KNOWLEDGE, INFORMATION, AND BEHAVIOR

Recycling coordinators for cities, advisors for technical councils at the county level, and directors and other administrators of recycling companies often believe that low recycling rates (or many other behaviors, for that matter) result from a lack of knowledge. From this basic assumption, the solution for increasing recycling rates is the distribution of educational materials about recycling. The basic assumption of this *knowledge-deficit theory* is that increasing knowledge will translate into a change in behavior. Three testable hypotheses can be derived from this theory. First, knowledge about recycling will be correlated with recycling behavior. Second, distributing educational materials containing information about recycling will lead to an increase in knowledge about recycling. Third, an increase in knowledge about recycling will lead to an increase in recycling behavior.

Before summarizing the research on these three topics, it is important to define some terms and to distinguish between different types of knowledge. Most of the research on knowledge as a predictor of recycling behavior has focused on *procedural knowledge*—that is, knowledge about the where, when, and how of recycling. For example, a resident may know that recycling is col-

lected on Tuesdays by placing three bins at the curb: one for newspapers, a second for glass and cans, and a third for plastics. This can be distinguished from *impact knowledge,* which refers to an individual's beliefs about the consequences of recycling. For example, making aluminum from recycled cans requires 95 percent less energy and generates 95 percent less pollution than mining and processing raw aluminum. This type of knowledge is especially important in the value-belief-norm theory, where beliefs act with values and norms as joint determinants of behavior (cf. Stern, 2000; Stern et al., 1999; Stern et al., 1993). A third type of knowledge is *normative knowledge*—beliefs about the behaviors of others. We use the term *belief* to refer to an individual's subjective understanding of the procedure, impact, or normativeness of recycling; knowledge refers to accurate beliefs. Beliefs may or may not be accurate, and yet, may still predict recycling behavior.

Does Knowledge Predict Recycling Behavior?

The short answer to this question is "Yes." The research addressing this issue has focused almost exclusively on procedural knowledge. For example, knowledge is often measured by asking participants to identify which materials are or are not recycled in their recycling program and coding the percentage of items correctly classified. The overwhelming finding from the research is that knowledge is a strong and consistent predictor of recycling behavior. In general, the more knowledgeable a person is about which materials are recyclable, and when and where materials are collected, the more likely that person is to recycle (De Young, 1989; Gamba and Oskamp, 1994; Lindsay and Strathman, 1997; Vining and Ebreo, 1990). In a meta-analysis of the correlates of recycling behavior, Hornik et al. (1995) identified 17 studies that examined the relationship between knowledge about recycling (i.e., procedural knowledge) and recycling behavior. The aggregate relationship across these studies was r=.54 (N=5,376). Among the variables examined in their review, knowledge was the strongest correlate of recycling.

This finding should not be surprising. Indeed, research on a variety of other behaviors (e.g., condom use, cigarette smoking, substance use among adolescents, energy conservation) has consistently found knowledge to be a strong correlate. Illustrative research on the relationship between knowledge and behavior can be found in the literature examining Fisher's Information-Motivation-Behavioral skills (IMB) model (cf. Bryan et al., 2000; Fisher et al., 1994; Fisher and Fisher, 1996).

Although encouraging, the strong relationship between knowledge and behavior may not be causal. There are three possible causal relationships. The first, and the one implicitly assumed in the knowledge-deficit model, is that knowledge causes action. Knowing more about recycling causes a person to recycle more often. A second possible causal relationship is that action causes

knowledge. That is, when a person recycles, he or she learns more about the behavior. Finally, an unspecified third variable may cause both knowledge and action. For example, a general interest in community activities may cause the individual to seek out information about recycling, and also to participate in a community-sponsored recycling program. Without additional data, the causal link is unclear.

Does Distributing Information Increase Knowledge About Recycling?

The second assumed connection in the knowledge-deficit model is that distributing information materials will cause an increase in knowledge. There is a substantial body of research on the development of persuasive educational materials, and a thorough review of this literature is beyond the scope of this chapter. However, chapters 6 and 7 in this volume address this issue (see also Petty and Wegener, 1998). Some of the key issues in developing an effective educational program are the complexity of the information presented, the medium through which the information is presented (e.g., newspapers, television or radio, printed brochures, posted signs or prompts), the framing of the message, and the credibility of the source. With these considerations in mind, researchers have been successful at creating information materials that increase knowledge about recycling (Littlejohn, 1997; Werner et al., 1997).

Does Changing Knowledge About Recycling Lead to a Change in Recycling Behavior?

This is the linchpin of the knowledge-deficit model. We have seen that knowledge correlates with behavior and that a well-designed education campaign can change beliefs and increase knowledge. But does this change in knowledge cause a change in behavior?

To address this question, an experimental study is needed in which households are randomly assigned to either receive or not to receive educational materials and subsequent changes in behavior are monitored. In the area of recycling, several studies have used this approach (cf. Schultz, 1999; Schultz and Tyra, 2000; Werner et al., 1997). The basic finding from these studies is that although distributing information materials can increase knowledge, this change in knowledge is associated with only a small, short-term change in behavior. For example, Schultz (1999) reported the findings from an experiment that disseminated information about the specifics of a local curbside recycling program to community residents. Residents were given information about the types of materials that were recyclable, along with information about collection procedures. Results showed only a small increase in recycling rates and the amount of material recycled, and no significant change relative to a control condition. In essence, information was not sufficient to produce a change in behavior.

Information Campaigns Are Cheap, but the Effects Are Short Lived

The results from the studies summarized suggest that the effectiveness of education campaigns to produce durable changes in behavior is dubious. In addition, changes that have been observed following information interventions to promote recycling are typically short lived.

So why, in the absence of evidence regarding the effectiveness of information-based campaigns, are they still widely used? First, they are cheap. Relative to other types of interventions, or to altering the recycling program itself, creating and disseminating educational materials is inexpensive. Schultz (1999) estimated a cost of approximately 3 cents per household to create and disseminate the materials for an information-based campaign. Second, creating informational materials is believed to require no special training in psychology or marketing, and it is a task that can be done by staff members already involved with the program. If residents simply need to be educated about recycling, then all that is needed is a list with details about recycling—most commonly to be included as an insert in the trash bill.

The reason that information campaigns often are ineffective is that they ignore the motives behind behavior. People recycle (or don't recycle) for reasons. A sizable number of studies have examined the reasons that people give for recycling, with some consistent findings (Gamba and Oskamp, 1994; McCarty and Shrum, 1994; Vining and Ebreo, 1990; Werner and Makela, 1999). Oskamp et al. (1998) identified four motivational factors associated with the level of recycling behavior:

- The benefits of recycling (e.g., satisfaction of saving natural resources, decreasing landfill use, saving energy),
- Personal inconvenience (e.g., no space for bins, no time to prepare materials, hard to move recycling bins to the curb),
- External pressure (e.g., friends and neighbors are doing it, pressure from friends, pressure from family), and
- Financial motives (earn money, decrease garbage costs).

Knowledge is not a motive for recycling. However, lack of knowledge can be a barrier to recycling. Several recent articles have suggested that in developing or modifying a social program, researchers must consider the barriers for the desired behavior (see also Gardner and Stern, 1996; McKenzie-Mohr and Smith, 1999). For example, McKenzie-Mohr (2000) argued that the first step in effective community-based social marketing is to uncover the barriers to the targeted behavior. These barriers can be external to the individual (e.g., lack of storage space for recycling bins) or internal (lack of knowledge about which materials are recyclable). Thus, lack of knowledge can be a barrier to recycling, and we would predict that an individual who knows what, when, and how to recycle would be more likely to do it.

When to Use Information

The research reviewed to test the knowledge-deficit model was, without exception, conducted within existing recycling programs. The findings clearly indicate that in such programs, disseminating information will not lead to a change in recycling behavior. However, given McKenzie-Mohr's work on community-based social marketing, it does seem that disseminating information can lead to a change in behavior in situations where lack of knowledge is a barrier to action. Three specific instances emerge in which knowledge may be a barrier to action. It is important to note that in each of these instances, people are motivated to act, but fail to do so because they do not know how.

1. *New program.* At the start of a new program, it is safe to assume that most people will not know the procedures for recycling. Disseminating information about the new program is likely to produce substantially more recycling behavior.
2. *Changing an existing program.* When an established program is changed, the change should be accompanied by information. For example, changes in the days of collection or the type of materials that are recyclable should be accompanied by information. To minimize the knowledge barrier, changes should be made sparingly.
3. *Complexity of procedures.* Programs that require procedures that are complex or difficult to remember should regularly disseminate information. For example, recycling programs with a long of list of materials that are, and are not, recyclable should disseminate this information on a regular basis.

In each of these instances, a lack of knowledge can be a barrier to action, and disseminating information is likely to produce an increase in recycling behavior. However, in existing programs where people have a basic understanding of the program, increasing knowledge will not lead to a change in behavior.

NORMATIVE EDUCATION: AN ALTERNATIVE APPROACH

The bulk of the research on knowledge about recycling and educational interventions to promote recycling has focused on increasing *procedural knowledge*. Given the limited effectiveness of education aimed at increasing procedural knowledge, it is useful to examine the research on *normative knowledge*—an understanding of the behaviors of others. In essence, these beliefs are perceived social norms. Cialdini and colleagues (1990) have distinguished between descriptive and injunctive social norms. *Descriptive* social norms are beliefs about what other people are doing—what Kallgren and colleagues (2000) refer to as norms of *is*. *Injunctive* social norms, in contrast, are beliefs about what other

people think *should* be done—norms of *ought*. Social norms can be distinguished from personal norms, which are feelings of obligation to act in a particular manner in specific situations. Schwartz and Fleishman (1978:307) define personal norms as "self-expectations for behavior backed by the anticipation of self-enhancement or [self]-deprecation." Personal norms differ from social norms in that they refer to internalized self-expectations, whereas social norms refer to external perceptions about the appropriateness of behaviors. The focus here is on normative beliefs that an individual holds about the behavior of others. Our interest is in normative beliefs, regardless of the accuracy of these beliefs.

Normative Beliefs Predict Behavior

There is considerable evidence, from a number of lines of psychological research, that normative beliefs (both descriptive and injunctive) are good predictors of behavior. A number of studies focused on recycling have reported a strong, positive relationship between normative beliefs and recycling behavior. In these studies, normative beliefs often are measured by asking about perceptions of social pressure to recycle—for example, from friends, family, or neighbors. These are perceptions of injunctive social norms—that is, they are an individual's belief that others think he or she should be recycling. In addition, several studies have asked residents about their perceptions of the frequency with which other people recycle. For example, studies may ask questions like, "How often do your neighbors put recyclables at the curb to be collected?" In their meta-analysis of recycling studies, Hornik et al. (1995) found an aggregate correlation of r=.43 (N=2,828) between perceptions of social influence and recycling behavior.

Research showing a positive association between normative beliefs and many different behaviors also can be found among studies utilizing the Theory of Reasoned Action and the Theory of Planned Behavior. The Theory of Planned Behavior proposes that attitudes, subjective norms, and perceived control predict behavioral intentions, which in turn lead to behavior (Ajzen, 1991; Fishbein and Ajzen, 1975; Fishbein et al., 1994). *Subjective norms* refer to a person's perceptions of the social pressure to perform a behavior; they are an individual's perceptions of how other people or groups think he or she should act. Subjective norms have been found to be strong predictors of a variety of behaviors (Ajzen, 1991). A sampling of some of these research areas includes studies using subjective norms as predictors of condom use (Baker et al., 1996; Richardson et al., 1997), substance use among adolescents (Morrison et al., 1996), intentions to commit driving violations (Parker et al., 1992), compliance with lithium treatment among people with bipolar affective disorder (Cochran and Gitlin, 1988), intentions to wear seatbelts (Thuen and Rise, 1994), and occupational choice among women (Greenstein et al., 1979).

Schultz and Tyra (2000) found that descriptive normative beliefs were strong predictors of recycling behavior, and that normative beliefs about people closer

to self were stronger predictors than beliefs about those who were more socially distant. For example, beliefs about the frequency of recycling by neighbors correlated r=.44 with recycling behavior; beliefs about recycling by "people in your neighborhood" correlated r=.31 with recycling behavior; and beliefs about recycling rates across the city correlated r=.17 with behavior.

The research just summarized clearly indicates that normative beliefs, both descriptive and injunctive, are predictive of a variety of behaviors. But do normative beliefs cause behavior? Guerra et al. (1995) suggest that commonly used rules may become injunctive simply because they are shared by many people. Although this assertion may hold for some behaviors, there are quite a few instances in which this would not apply—for instance, where an individual perceives that a behavior is desired but does not perceive that others are doing it, or in situations where the behavior is not directly observable by other community members. In these situations, normative beliefs would not predict behavior. Some of these situations can be characterized as commons dilemmas (Hardin, 1968), where a behavior is prescribed (both individually and collectively), but not commonly observed.

Recycling is a behavior that benefits the collective, with few direct rewards for the individual (excluding cash redemption centers), and recycling has a cost to the individual in terms of convenience, sorting, and storage. The behavior is socially accepted, and people generally believe they should recycle. But if no one else is doing it, why should I? One of the consistent findings from research on the commons dilemma is that communication can lead individuals to act in the interest of the group (Dawes et al., 1990; Schelling, 1966). Individuals are considerably more likely to reduce their use of the common when they believe that others who share access to the common also will limit their use. For example, I am much more likely to conserve energy if I believe my neighbor is also making an effort to conserve energy. Thus, disseminating information about the behavior of others (i.e., descriptive norms) is a mechanism for communication and an important way to overcome the commons dilemma.

Does Changing Normative Beliefs Cause a Change in Behavior?

The data just described suggest that normative beliefs can predict behavior. But what about instances in which an individual does not already possess injunctive or descriptive normative beliefs regarding a behavior, or instances where a descriptive belief is too low (i.e., hardly anyone in my community recycles) or too high (nearly everyone in my school smokes marijuana)? To what extent does changing a normative belief lead to a change in behavior? The opposite sequence seems possible, if not likely—that is, that many descriptive social norms are created to justify or validate behavior. For example, an individual may come to believe that a behavior (e.g., smoking, recycling, drug use, wearing seatbelts) is more common than it really is only after engaging in the behavior. Likewise, one

may come to believe that a behavior (e.g., cheating on an exam, littering, running a red light) is more reprehensible after not engaging in it. Such an effect may result from a "false consensus," wherein we tend to believe that others share our views (Fabrigar and Krosnick, 1995; Suls et al., 1988). One way to assess the causal link is to change normative beliefs experimentally and then to observe any subsequent change in behavior.

Only a few studies have attempted to manipulate normative beliefs experimentally. One such study came from a program to reduce and prevent adolescent drug use. Donaldson and his colleagues (Donaldson et al., 1994; Donaldson et al., 1995) reported a series of studies on a normative education intervention designed to change adolescents' beliefs about the prevalence of substance use by their peers. Over a period of five sessions, the program presented information about alcohol and drug use that established a conservative normative atmosphere in the school regarding substance use. Results from the longitudinal study showed that the effectiveness of an adolescent drug use prevention program was mediated largely by changes in beliefs about the prevalence and acceptability of substance use among peers.

Schultz (1999) reported a study on the effects of a normative intervention within a community curbside recycling program. Study participants were community residents in a large metropolitan suburb. Approximately 120 houses were systematically assigned to each of five experimental conditions: individual normative feedback (targeting injunctive social norms), group normative feedback (targeting descriptive social norms), information, plea only, and control. The results showed that, overall, households in the injunctive norm condition recycled significantly more often and more material per week during a 4-week followup period than they did during the baseline period. For the descriptive norm condition, results showed a similar significant increase in the frequency of participation and in the amount of material recycled. The information, plea-only, and control conditions showed no significant change across time.

Practical Approaches for Making Recycling Normative

The research summarized shows that normative beliefs are causally linked with behavior. That is, normative beliefs predict behavior, and changing normative beliefs can cause a change in behavior. A remaining question is: how do we change normative beliefs? I offer two suggestions here.

Block leaders. A number of studies have examined the effectiveness of neighborhood leaders at promoting recycling. Within this approach, communities are divided into small residential areas, and volunteers are recruited from each area to serve as a block leader. These leaders are asked to take responsibility for the recycling within their neighborhood, to recycle diligently, and to encourage neighbors to recycle. Studies on the effects of block leader programs indicate

that they have a direct effect on normative beliefs (particularly injunctive normative beliefs, but descriptive norms as well). In addition, block leader programs have been very successful at producing sustained increases in recycling behavior (Burn, 1991; Hopper and Nielsen, 1991; Shrum et al., 1994).

Disseminating data on community recycling rates. A second approach to making recycling normative is through the dissemination of recycling information to residents. This can occur through community newsletters, newspaper articles, public service announcements, or inserts in the recycling or trash bill. Note that this approach is most effective in areas where there is a low descriptive norm, but many people are actually recycling. That is, the disseminated normative information must be higher than the overall normative belief among residents. Publishing a statistic that "50 percent of residents in San Marcos recycle regularly" will only lead to an increase in recycling if the existing normative belief among residents is that fewer than 50 percent recycle regularly. Some types of normative information that can be distributed include percentages of people who recycle each week, the percentage of solid waste that is recycled by residents, or the number of recycling bins placed at the curb by residents each week.

In all cases, it is important to keep the normative information specific to the level of the individual, providing a standard against which an individual can compare his or her behavior. For example, providing information about the recycling rates across the city, or about the citywide diversion rate, will be unlikely to change behavior. This type of information is not connected with a specific behavior, and does not provide a clear standard against which a person can compare his or her behavior. Instead, we advocate targeting specific behaviors like "place recyclables at the curb to be collected" or "use designated bins for greenwaste." Likewise, we advocate using comparison groups that are closer to the individual with statements like "people in your community" or "your neighbors" rather than broader comparisons at the city, county, or even state levels.

The Limits of Normative Intervention

The previous discussion suggests that, unlike knowledge, normative beliefs can be a powerful motive for action. However, it is important to point out that normative beliefs are more likely to lead to behavior under a specified set of conditions.

A large body of social psychological research on conformity suggests that beliefs about the behavior of others are more likely to influence our own actions under a specific set of conditions. One of the most important considerations is whether the behavior is publicly observable. Behaviors that are more observable are more likely to be affected by changes in normative beliefs. Classic social psychological studies of conformity have shown that people conform more when

they respond publicly (in front of others) than when they respond privately (Asch, 1946, 1955). The observability of a behavior interacts with normative beliefs in two ways. First, behaviors that are observable can be monitored by others. In situations where there is an injunctive normative belief for the behavior (e.g., people in my community think I should recycle), this monitoring function is likely to lead to an increased compliance with the norm. If, on the other hand, the behavior is not publicly observable (for example, household energy conservation, backyard composting, or proper disposal of hazardous household waste), then promoting a normative belief is less likely to change behavior.

A second aspect of the observability of a behavior has to do with the development of descriptive normative beliefs. Behaviors that are publicly observable reinforce (or undermine) existing descriptive normative beliefs. When we can monitor the behavior of others, their actions will directly affect our normative beliefs. For example, observing that my neighbors rarely put recyclables at the curb to be collected is likely to produce a low descriptive norm. Even if presented with information that a higher percentage of people in my community recycle, unless I observe my neighbors doing it, I am unlikely to believe the message or change my normative belief. On the other hand, if my neighbors regularly put a great deal of recyclables at the curb each week, my observations of their behavior will lead to a high descriptive norm.

Although the observability of a behavior is one of the more powerful conditions under which normative beliefs will affect behavior, other aspects of the situation can also play important roles. Variables like perceived similarity with others in the community, status of people who are engaging in the behavior, prior commitment to act in a particular manner, size of the group, and cohesion of the group are all variables that can affect the effectiveness of a normative intervention.

Overall, social psychological research on conformity suggests that normative social influence works best with behaviors that are publicly observable—like curbside recycling. Other behaviors that are less observable, like energy consumption or proper disposal of hazardous household waste, may be less affected by normative social influence.

CONCLUSIONS

This chapter has synthesized the research findings regarding knowledge and the effectiveness of certain educational interventions intended to promote recycling. We distinguished between procedural knowledge, impact knowledge, and normative knowledge. The results from a variety of studies suggest that knowledge about recycling is a strong correlate of recycling behavior. This conclusion is qualified by the concept that knowledge does not provide a motive for behavior, but instead it is a lack of knowledge that is a barrier to behavior. Research also demonstrates that it is possible to increase knowledge about a behavior (proce-

dural or normative) by disseminating information. However, the findings show that although information can lead to an increase in knowledge, its effect on behavior tends to be small and short term. An alternative to procedural information is to distribute normative information to residents. Like procedural knowledge, normative beliefs are strong predictors of behavior, and they can be changed through the use of education. However, unlike procedural knowledge, normative beliefs provide a motive for behavior, and changing normative beliefs can cause a change in behavior.

The data used to support these conclusions were drawn primarily from the literature on recycling. However, I believe that the findings apply to a range of other human behaviors. Previous research in other areas of applied psychology (particularly health psychology) has found similar results, and the findings would seem to generalize to many of the behaviors addressed in this volume: energy conservation, "green" buying, public health communication, household disaster preparedness, pollution prevention, and more general environmental education. Across these areas, the basic argument outlined in this chapter would apply: Increasing knowledge does not translate into a change in behavior.

NOTE

1 Industrial and transportation-related wastes are not included in these statistics.

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